213. Proposed by W. J. GREENSTREET, M. A., Marling School, Stroud, England.

Two unequal, uniform, smoothly hinged rods are placed over a smooth vertical circle. Apply the principle of vertical work to find the condition of equilibrium in terms of the length of each rod, the diameter of the circle and the angle of either rod with the vertical.

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

151. Proposed by E. B. ESCOTT, Ann Arbor, Mich.

In the recurring series, $n = 0, 1, 2, 3, 4, 5, 6, 7, \ldots$
$$u_n = 3, 0, 2, 3, 2, 5, 5, 7, \ldots$$
where the scale of relation is $u_{n+3} = u_{n+1} + u_n$, prove that u_p is always divisible by p when p is prime. Is the converse true?

AVERAGE AND PROBABILITY.

193. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

What is the average area of all squares that may be inscribed in a given sector of a circle, a diagonal of the square being parallel to a random line across the sector?

194. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

What is the mean value of the triangle formed by joining three points taken at random on the circumference of a circle?

MISCELLANEOUS.

176. Proposed by WM. E. HEAL, Coffeyville, Kansas.

In Grassman's *Extensive Algebra*, $e_1e_2 = -e_2e_1$. If $e_1 = e_2$, $e_1^2 = -e_1^2$ $= 0$. In quaternions, $ij = -ji$, $i^2j = i.ij = ik = -j$, $i^2 = -1$. Reconcile these apparently divergent results.

NOTES AND NEWS.

The next Summer meeting of the American Mathematical Society will be held at the University of Illinois during September.

On December 17th occurred the death of Lord Kelvin, one of the greatest mathematicians and physicists of the present age.

On the 7th of November, 1907, occurred the death of Professor J. R. Rand, Professor of Mathematics in Bates College, Lewiston, Me. His successor is George E. Ramsdell.

During the last convocation week, Professor G. A. Miller was elected vice president of the American Mathematical Society, chairman of the Chicago Section of this Society, and secretary of Section A of the American Association for the Advancement of Science. The last position is for five years, while the other two are for one year only.

BOOKS.

Irrational Numbers and their Representation by Sequences and Series. By Henry Parker Manning, Ph. D., Assistant Professor of Pure Mathematics in Brown University. 12mo. Cloth, vi+123 pages. Price, $1.25. New York: John Wiley & Sons.

In this book, the author has given an explanation of irrational numbers and those parts of algebra which depend on the Theory of Limits. An *irrational number* is defined by the position it occupies among rational numbers, the definition given by Dedekind.

The book contains five chapters, of which the first deals with Irrational Numbers; the second, Sequences; the third, Series; the fourth, Power Series; and the fifth, the Exponential, Binomial, and Logarithmic Series.

The work will prove very helpful to all teachers of mathematics who wish to know something of the modern views of irrational numbers and series.　　　　　F.

Introduction to Higher Algebra. By Maxime Bôcher, Professor of Mathematics in Harvard University. Prepared for publication with the co-operation of E. P. R. Duval, Instructor in Mathematics in the University of Wisconsin. 8vo. Cloth, xi+321 pages. Price, $2.00. New York: The Macmillan Co.

The object of this book is to "introduce the student to higher algebra in such a way that he shall, on the one hand, learn what is meant by a proof in algebra and acquaint himself with the proofs of the most fundamental facts, and, on the other, become familiar with many important results of algebra which are new to him."

The book contains twenty-two chapters. Some notion of what the work contains may be gained from the subject treated under each of the chapters. Chapter I treats of Polynomials and their most Fundamental Properties; Chapter II, a Few Properties of Determinants; Chapter III, The Theory of Linear Dependence; Chapter IV, Linear Equations; Chapter V, Some Theorems concerning the Rank of a Matrix; Chapter VI, Linear Transformations and the Combination of Matrices; Chapter VII, Invariants,—First Principles and Forms; Chapter VIII, Bilinear Forms; Chapter IX, Geometric Introduction to the Study of Quadratic Forms; Chapter X, Quadratic Forms; Chapter XI, Real Quadratic Forms; Chapter XII, The System of a Quadratic Form and One or More Linear Forms; Chapter XIII, Pairs of Quadratic Forms; Chapter XIV, Some Properties of Polynomials in General; Chapter XV, Factors and Common Factors of Polynomials in One Variable and of Binary Forms; Chapter XVI, Factors of Polynomials in Two or More Variables; Chapter XVII, General Theorems on Integral Rational Invariants; Chapter XVIII, Symmetric Polynomials; Chapter XIX, Polynomials Symmetric in Pairs of Variables; Chapter XX, Elementary Divisors and the Equivalence of λ-Matrices; Chapter XXI, The Equivalence and Classification of Pairs of Bilinear Forms and Collineations; Chapter XXII, The Equivalence and Classification of Pairs of Quadratic Forms.

While, in the reading of this book, no algebraic knowledge is presupposed beyond a